Abstract Submitted
for the MAR12 Meeting of
The American Physical Society

**Charge dynamics in Mott-insulating and charge-ordered organic crystals: a possibility of the Berezinskii-Kosterlitz-Thouless transition** YAMAGUCHI TAKAHIDE, TOHRU WATANABE, YOSHIHIKO TAKANO, KOUTA KODAMA, SHINYA UJI, National Institute for Materials Science, HIROSHI M. YAMAMOTO, RIKEN — The organic Mott insulator $\kappa$-(BEDT-TTF)$_2$Cu[N(CN)$_2$]Cl exhibits power-law current-voltage characteristics in a low current range at temperatures below $\approx$ 10 K. The power-law current-voltage characteristics are similar to those observed in the charge-ordered organic crystals $\theta$-(BEDT-TTF)$_2$MZn(SCN)$_2$ (M = Cs and Rb) and are accounted for in the same way in terms of exciton excitations: The electric field assists the thermal unbinding of pairs of a doublon and a holon that attract each other due to the two-dimensional long-range Coulomb interaction. The two-dimensional Coulomb interaction arises from the layered structure of the organic crystals and their large dielectric anisotropy. The in-plane dielectric constant can be understood within the context of the same model in terms of polarization of the bound pairs. We discuss a possibility of the Berezinskii-Kosterlitz-Thouless transition in these layered organic crystals. $\kappa$-(BEDT-TTF)$_2$Cu[N(CN)$_2$]Cl has a much smaller magnetoresistance (25 % in 10 T at 0.3 K) than $\theta$-(BEDT-TTF)$_2$CsZn(SCN)$_4$ ($\approx$10000 % in 10 T at 0.1 K), which probably reflects different spin states of the excitations for the Mott and charge-ordered states. Yamaguchi Takahide et al. PRB 84, 035129 (2011)

Yamaguchi Takahide
National Institute for Materials Science

Date submitted: 11 Nov 2011 Electronic form version 1.4